Surgical Technique

smith&nephew

TRIGEN◇ META-NAIL◇

Retrograde Femoral Nail System

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Nota Bene
The technique description herein is made available to the healthcare professional to illustrate the authors' suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the patient.

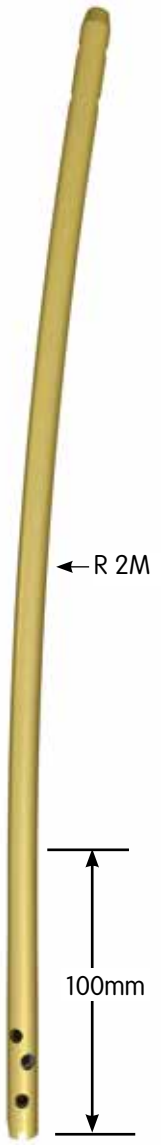
Introduction

The following technique is for informational and educational purposes only. It is not intended to serve as medical advice. It is the responsibility of treating physicians to determine and utilize the appropriate products and techniques, according to their own clinical judgment, for each of their patients. For more information on the TRIGEN® META-NAIL® Retrograde Femoral Nail System, including its indications for use, contraindications, and product safety information, please refer to the product's label, the Instructions for Use (REF 81068703) packaged with the product, and, if using the TRIGEN SURESHOT® Distal Targeting System, the TRIGEN SURESHOT Distal Targeting System User Manual (REF 7118-1540).

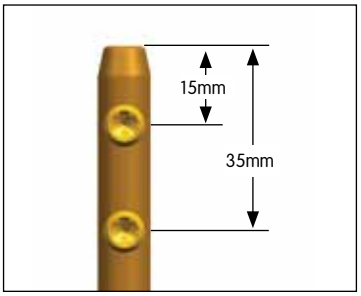
The TRIGEN META-NAIL Retrograde Femoral Nail is indicated for fractures of the femur including stable and unstable distal metaphyseal fractures, diaphyseal fractures, intraarticular fractures, periprosthetic fractures, nonunions, malunions and for the prophylactic nailing of impending pathological fractures.

The META-NAIL System can be used with or without the SURESHOT Distal Targeting System. If using the SURESHOT Distal Targeting System, be sure to read and understand the TRIGEN SURESHOT Distal Targeting System User Manual (REF 7118-1540). Only trained operators are allowed to use the TRIGEN SURESHOT Distal Targeting System.

TRIGEN® META-NAIL® Retrograde Femoral Nail Specifications

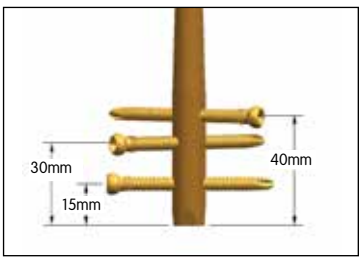


ML view



Non-driving end of nail

Top view of nail



Driving end of nail

Note: These views are not to scale and should be used as a pictorial representation only.

Specifications	TRIGEN META-NAIL Retrograde Femoral
Material	TI6Al4V
Diameter	10, 11.5 and 13mm
Lengths	18–50cm*
Nail color	Gold
Cross section	Round
Distal diameter (driving end)	12mm (10, 11.5 diameter) 13mm (13 diameter)
Proximal diameter (non-driving end)	10, 11.5 and 13mm
Smallest through diameter	5.0mm
Wall thickness	2.3mm (10 diameter) 3.0mm (11.5 diameter) 2.3mm (13 diameter)
Guide bolt thread	5/16–24 UNF
Screw diameter	5.0mm
Screw color	Gold
Major diameter	5.0mm
Minor diameter (core)	4.3mm
Screw lengths	25–110mm
Hex size	4.7mm
Alternative hexdrivers	RT Femoral and Recon 7.0mm Cannulated Screw PERI-LOC® 4.7mm Hexdriver, PROFIX® 4.7mm Hexdriver
Alternative modes	No
Distal Locking (driving end)	
Static lock locations/orientations	15mm/ML – Threaded, can be locked with META-NAIL cap set screw 30mm/25° – Threaded w/bushing 40mm/25° – Threaded w/bushing
Static locking hole dimensions	Threaded 4.5mm minor diameter Threaded 5.3mm major diameter
Proximal Locking (non-driving end)	
Static lock locations/ orientations	15mm/AP 35mm/AP
Static locking hole dimensions	5.3mm
Proximal screw hole diameter	5.3mm
AP bow radius	2m
AP bow location	Starts 100mm from driving end

* Set does not include all sizes; Additional sizes may be special order only.

Surgical technique

Patient positioning

1. Position the patient supine on a radiolucent table. Flex the affected limb approximately 45° over a posterior support to assist with fracture reduction (Figure 1). Check for length and rotation by comparison to the unaffected limb.
2. Rotate the C-Arm to ensure optimal AP (anteroposterior) and lateral visualization of the entire femur. The C-Arm should be able to freely access the femur up to and including the intertrochanteric area. A distraction device may also be applied to obtain and/or maintain traction.
3. Address intra-articular fracture components with interfragmentary screw fixation prior to nail insertion. Be sure to place the screws in the anterior and posterior aspect of the distal femur and safely out of the nail's intended path.

   Note: Cannulated screw Guide Pins allow confirmation of definitive screw placement prior to fracture fixation and nail insertion.
4. Use a bolster or radiolucent triangle to maintain limb position. Rotate the C-Arm to ensure optimal AP and lateral visualization of the entire femur. A distraction device may also be applied to obtain and/or maintain traction (Figure 2).

   Caution: *If using the TRIGEN® SURESHOT® Distal Targeting System, verify that there are no metal objects in the immediate targeting area. Metal interference will cause the SURESHOT System to be inaccurate.*

Figure 1

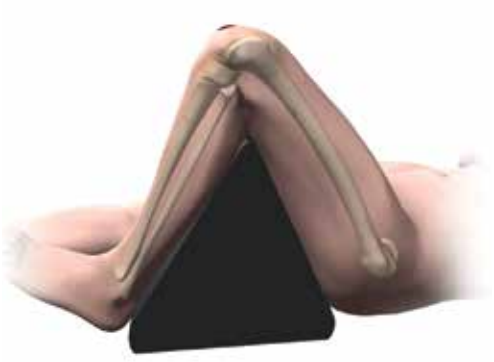


Figure 2

Establish the incision and entry portal

1. Inspect the Entry Portal Tube (7167-4060) to ensure that it is not damaged, bent or chipped. Any flaws in the tube can lead to damage of the surrounding tendons and tissues.
2. Assemble the Honeycomb (7167-4075), Entry Portal Handle (7167-4092), and Entry Tube (Figure 3) by pulling back the black trigger of the Entry Portal Handle and inserting the Entry Tube into the handle ring.

   Turn the tube until it clicks into the locked position.

   Optional: Suction can be applied to the Entry Portal Handle.
3. Make a 3–4cm midline skin incision, followed by a medial parapatellar capsular incision to expose the intercondylar notch (Figure 4). Gently retract the patellar tendon laterally.

Figure 3

Figure 4

Entry portal acquisition

Locate the entry point within the intercondylar notch just anterior and lateral to the femoral attachment of the posterior cruciate ligament (Figure 5).

1. Attach a 3.2mm Brad Point Guide Pin (7167-4130 or 7163-1436) to the drill via the Mini Connector (7163-1186).
2. Insert the Guide Pin into the distal femoral metaphysis to a depth of 6–8cm (Figure 6).

   Note: The entry portal instrumentation serves as a soft-tissue protector.
3. The Guide Pin should be in line with the femoral axis in the AP view and anterior to *Blumensaat's Line* in the lateral view (Figure 7).

   Note: If suboptimal Guide Pin insertion occurs, rotate the Honeycomb within the Entry Portal Tube to the desired location and insert another 3.2mm Brad Point Guide Pin (Figure 8).

   Note: Do not over-insert the Guide Pin as this can establish a false trajectory and cause fracture malalignment.

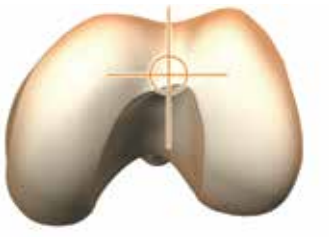


Figure 5

Figure 6

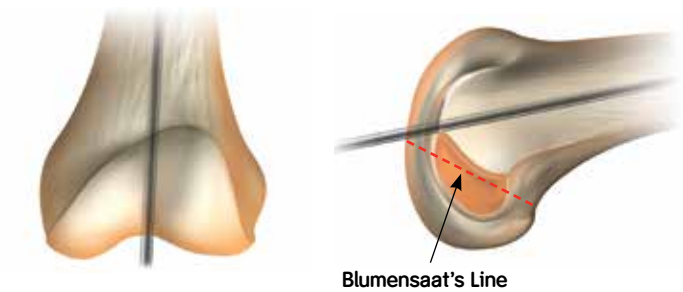


Figure 7

Figure 8

Entry portal

1. After Guide Pin placement, remove the Honeycomb (7167-4075) from the Entry Tube along with any additionally inserted Guide Pins.
2. Attach the 12.5mm Entry Reamer (7163-1116) to a power drill. Advance the reamer over the Guide Pin and through the Entry Tube to a depth of 6–8cm (Figure 8).
3. Check the position of the Entry Reamer via radiographic imaging and then remove the Entry Reamer and Guide Pin.

Figure 9

Alternative technique: Entry portal

1. With the Entry Tube and Entry Portal Handle still in the joint space, attach the T-handle (7167-4076 or 7167-4576) to the Cannulated Awl (Figure 9).

   Note: Introduce the 3.2mm T-handle Trocar (7167-4074) (Figure 10) into the back of the assembly prior to insertion in order to prevent awl slippage and the accumulation of cortical bone within the cannulation.
2. Insert the awl into the distal femur to a depth of 6–8cm.

Figure 10

Figure 11

Reduce the fracture

1. Open the Gripper (7167-4080).
2. Insert the smooth end of the 3.0mm Ball Tip Guide Rod (7163-1626) into the front of the Gripper (Figure 12) and gently close the trigger grip.
3. Connect the 8.5mm Reducer and the Reducer Connector (7167-4077) so that the words “Slot Orientation” on the connector are in line with the opening at the Reducer’s tip (Figure 13).
4. Connect the Reducer and connector to the T-handle (7167-4076 or 7167-4576) to complete the assembly.

   Note: If blocking screws are desired at this point in the procedure, refer to *Appendix A*, the “Blocking Screw Technique,” at the back of this document.
5. Advance the Reducer through the Entry Tube into the intramedullary canal (Figure 14).
6. Use the curved tip of the Reducer to direct the 3.0mm Ball Tip Guide Rod past the fracture into the region of the distal epiphyseal scar.

   Note: The guide rod should be center-center in the AP and lateral views (Figure 15).
7. Once the guide rod is at the desired depth, detach the Gripper and prepare to remove the Reducer from the femoral canal.
8. Remove the Reducer from the femoral canal.

   Note: During extraction, slide the Obturator (7167-4078) into the T-handle in order to maintain guide rod position within the canal (Figure 16).

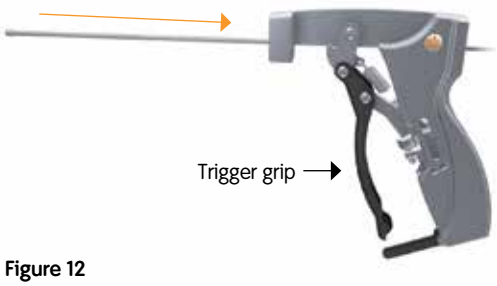


Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Determine the implant length

1. Confirm that the Ruler (7167-4079) opens easily. If it does not, adjust the thumb wheel connection at the end to ensure free movement.
2. After the Reducer has been removed, reconfirm the guide rod placement within the proximal femur.
3. Slide the Ruler over the guide rod until its metal tip contacts the distal femur (Figure 17).
4. Confirm guide rod position in the window at the opposite end of the Ruler in order to ensure accurate implant measurement (Figure 18).
5. Push down on the top of Ruler until it contacts the 3.0mm Ball Tip Guide Rod.
6. Read the implant length from the exposed calibrations at the end of the Ruler.
7. Confirm fracture reduction to ensure that the implant length is not underestimated.

   Note: When selecting the implant length, consider that the nail must be countersunk below the articular surface of the distal femur.

Figure 17

Figure 18

Reamed technique

1. Use the 9.0mm End Cutting Reamer Head (7111-8231) and Flexible Reamer Shaft (7111-8200) to ream the intramedullary canal sequentially in half-millimeter increments to a size 1.0–1.5mm larger than the selected nail size (Figure 19).
3. Insert the Obturator (7167-4078) into the back of the reamer unit during retraction to ensure proper Guide Rod placement during reaming.
4. Continue to confirm correct Guide Rod placement in the proximal femur throughout reaming.

   Note: Periodically move the reamer backward and forward in the canal to clear debris from the cutting flutes.

Figure 19

Nail assembly

1. Use the Guide Bolt (7165-4506) to attach the META-NAIL° Drill Guide (7165-4502) to the nail.
2. Tighten with the Guide Bolt Wrench (7163-1140) and T-handle. The nail is correctly aligned when:
   - The vertical black line on the posterior side of the insertion barrel aligns with the line on the posterior side of the nail.
   - The "A" on the anterior side of the nail aligns with the "A" on the anterior side of the insertion barrel (Figure 20).
   - The apex of the nail's AP Bow faces posteriorly and the drill guide is oriented anteriorly (Figure 21).

   Note: The bevel on the front of the nail marks the connection to the drill guide and can be seen in the lateral view as a means to determine proximal insertion depth.

   Note: Do not use the META-NAIL Extension Drill Guide, as the insertion barrel of the META-NAIL Extension Drill Guide is too short to adequately countersink the nail.
3. Attach the Anterior Drop (7165-4501) to the Drill Guide (Figure 22).
4. To verify the accuracy, insert a gold 9.0mm Drill Sleeve (7163-1152) and silver 4.0mm Drill Sleeve (7167-4083) into the Drop. (Figure 22)
5. Pass a 4.0mm Long Pilot Drill (7163-1110)* through the drill sleeves.

   Note: An incorrectly attached nail will not target.

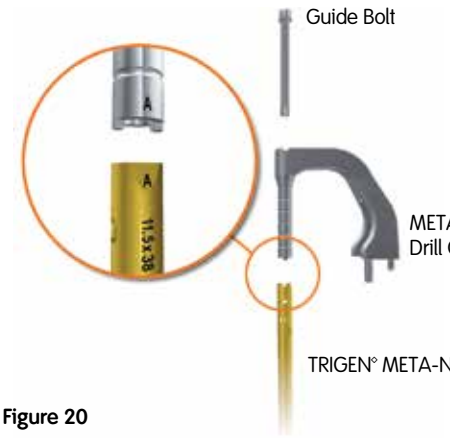


Figure 20

Figure 21

Figure 22

*The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with the 4.0mm AO Long Drill (7163-1121).

Nail insertion

1. Detach and remove the Anterior Drop.
2. Attach the Cannulated Impactor-Medium (7167-5081) to the drill guide (Figure 23).
3. Orient the drill guide assembly in the AP (anteroposterior) position.
4. Use light blows on the Slotted Hammer (7167-4082) to tap and advance the nail over the guide rod to the desired depth.

   Note: If excessive force is required to insert the nail, additional reaming of the intramedullary canal may be required.
5. Verify fracture reduction as the nail crosses the fracture site. Pay close attention to rotation, length, alignment, distraction and/or shortening.
6. Check the final nail position in both the AP and lateral views for correct alignment.

Figure 23

Check nail depth

Distal

In the AP and lateral views, confirm nail position within the distal femur. The notch at the nail/drill guide junction will be visible in the lateral view. Each circular groove on the drill guide's insertion barrel represents a 10mm depth interval (Figure 24).

Figure 24

Proximal

1. In the AP view, confirm that the nail has been inserted to the desired depth (Figure 25).

   Note: Femoral fractures should be treated with the longest nail possible in order to reduce the likelihood of stress risers.
2. Remove the guide rod once the nail has been fully seated.
3. Attach the Anterior Drop.
4. Following nail insertion, confirm that the nail and drill guide are securely connected as hammering can loosen the Guide Bolt.

   Note: If using the SURESHOT® Distal Targeting System, refer to the TRIGEN® SURESHOT Distal Targeting System's User Manual (REF 7118-1540) for the field accuracy check instructions.

Figure 25

Lock the screw

Locking screw options

Distal locking options include three statically locked threaded holes that are targeted through the orange and green color-coded holes on the Anterior Drop (Figure 26).

Proximal locking options include two statically locked, non-threaded AP holes (Figure 27).

Gold 5.0mm locking screws are compatible with 10, 11.5 and 13mm diameter nails.

Note: For information regarding Drill Depth Measurement Software (DDM) using the TRIGEN® SURESHOT® Targeting System, refer to the TRIGEN SURESHOT Targeting System User Manual (7118-1540). The DDM software can be used for distal locking only.

Note: The 4.0mm Short Step Drill (7164-1123) may be used to drill a gold 5.0mm locking screw in the instance of hard cortical bone. The 4.0mm Short Step Drill diameter transitions from 4.7mm to 4.0mm to facilitate screw insertion without compromising purchase.

Figure 26

Figure 27

*The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with the 4.0mm AO Long Drill (7163-1121).

Distal locking

1. Make a small incision at the site of screw entry.
2. Insert the gold 9.0mm Drill Sleeve (7163-1152), 4.0mm Drill Sleeve (7167-4083), and Screw Depth Gauge (7163-1189) through the desired slot on the Anterior Drop (Figure 28) down to the bone.
3. Drill both cortices with the 4.0mm Long Pilot Drill*.
4. Measure for screw length using either the calibrations on the 4.0mm Long Pilot Drill* or by removing the 4.0mm Drill Sleeve and using the Screw Depth Gauge.
5. Attach the appropriate-length screw to the end of the Medium Hexdriver (7163-1066).
6. Use power to insert the screw through the gold 9.0mm Drill Sleeve until the laser-etched ring on the Hexdriver reaches the back of the Drill Sleeve.
7. Attach the T-handle to the Hexdriver.
8. Manually tighten the screw.

   If additional fixation is required, the TRIGEN® STABLE-LOK® Nut and Washer (Part #7163-2001) offers increased purchase in low density or osteoporotic bone. For information about how to use the STABLE-LOK Nut and Washer, refer to *Appendix B*, "TRIGEN STABLE-LOK Nut and Washer," at the back of this document.

Figure 28

*The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with the 4.0mm AO Long Drill (7163-1121).

Proximal locking

Proximal locking is performed in the AP plane using a free-hand technique.

1. Confirm fracture reduction and align the C-Arm over the desired locking hole.
2. Obtain a “perfect circle” image of the locking hole.

   Note: If using the SURESHOT® Distal Targeting System, refer to the TRIGEN® SURESHOT Distal Targeting System’s User Manual (REF 7118-1540).
3. Use a blunt object to dimple the skin at the approximate location of the locking hole.
4. Make a small stab incision at the site of screw entry.
5. Insert the 4.0mm Long Pilot Drill* and drill both cortices.
6. Measure for screw length using the Screw Depth Gauge.

   or

   Leave the drill in place, insert the Long Screw Length Sleeve down to bone, and read the exposed calibrations from the drill (Figure 29).
7. Use the Medium Hexdriver/T-handle assembly to insert the appropriate-length screw.

Figure 29

*The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with the 4.0mm AO Long Drill (7163-1121)

TRIGEN® Nail Cap and Nail Cap Set screw insertion: optional

1. Remove the drill guide/Anterior Drop assembly.
2. Attach the selected Nail Cap (Figure 30) or Nail Cap Set Screw to the Medium Hexdriver/ T-handle assembly.
3. Insert the Nail Cap into the end of the nail until it is tight.

   Note: The TRIGEN Nail Cap Set screw engages the most distal locking screw to create a fixed construct.

   Note: If cross-threading occurs, rotate the Nail Cap or Nail Cap Set Screw counter-clockwise until its threads line up with those of the nail. Proceed with Nail Cap insertion until it is tight.

Figure 30

Figure 31

Nail extraction: optional

Standard technique

1. Use the Medium Hexdriver/T-handle assembly to remove the Nail Cap or Nail Cap Set Screw (if implanted), all of the proximal locking screws, and all but one of the distal locking screws.
2. Thread the Cannulated Impactor-Medium (7167-5081) or Cannulated Impactor-Long (7163-1185)* into the back of the Disposable Nail Extractor (7163-1320)**.
3. Thread the assembly into the end of the nail.
4. Remove the remaining distal locking screw.
5. Use the Slotted Hammer with a back-slapping motion to extract the nail (Figure 32).

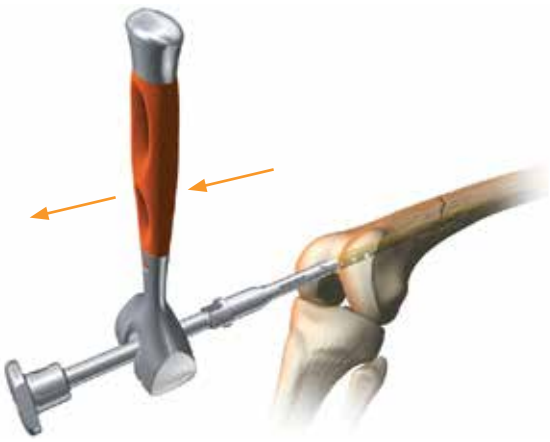


Figure 32

Percutaneous technique

In the absence of a Nail Cap or Nail Cap Set Screw:

1. Use the Medium Hexdriver/T-handle assembly to remove all proximal locking screws and all but one of the distal locking screws.
2. Under fluoroscopy, insert a 3.2mm Brad Point Guide Pin into the end of the nail either using power or by hand (Figure 33).
3. Make a incision large enough to accept the 12.5mm Entry Reamer at the pin-skin site.
4. Advance the 12.5mm Entry Reamer over the pin and into the end of the nail to remove any bony ingrowth (Figure 34).

   Note: It is the flared portion of the Entry Reamer that enters the top of the nail.
5. Thread the Cannulated Impactor-Medium or Cannulated Impactor-Long (7163-1185) into the back of the Disposable Nail Extractor** (7163-1320).
6. Thread the assembly into the end of the nail.
7. Remove the remaining distal locking screw.
8. Extract the nail with a back-slapping motion

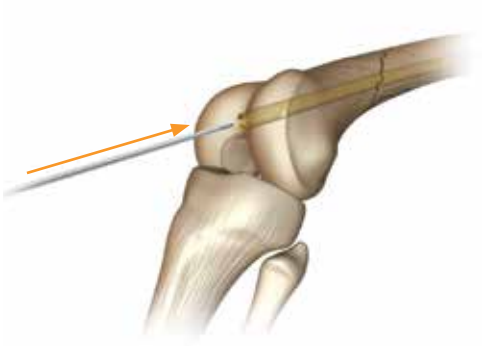


Figure 33

Figure 34

* The Cannulated Impactor-Long is located in the original TRIGEN® Instrument Set (7163-1326).
** The Disposable Nail Extractor (7163-1320) is interchangeable with the Large Nail Extractor located in the original TRIGEN Instrument Set (7163-1326) and the HFN® Instrument Set (7170-0001).

An alternative method for extraction

Guide rod jamming technique

1. Advance the end of a 3.0mm Ball Tip Guide Rod through the end of the nail.
2. Insert the smooth end of a 2.0mm ball tip guide rod (7175-1146) in the same manner.
3. With both guide rods in place, attach the Gripper to the end of the 3.0mm Ball Tip Guide Rod.
4. Pull the Gripper back so that it wedges the ball tip against the 2.0mm Guide Rod.
5. Backslap against the Gripper with the Slotted Hammer to extract the nail.

Guide rods	
Cat. No.	**Description**
7175-1146	2.0mm x 600mm Ball Tip Guide Rod
7163-1626	3.0mm x 1000mm Ball Tip

Additional removal items	
Cat. No.	**Description**
115074	Large Extractor Hook*
115073	Small Extractor Hook*

*Available sterile packed. For nail removal only: do not use for nail insertion.

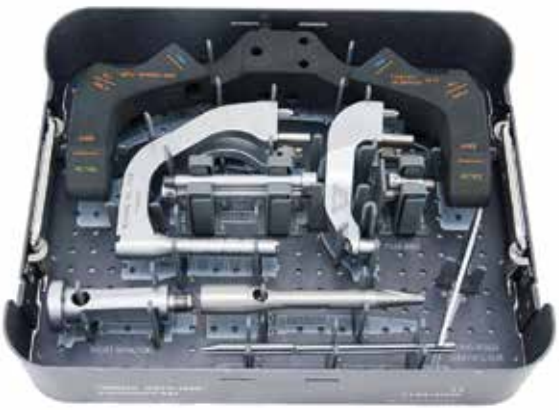
Catalog information

TRIGEN® Base Instrument Set

Set No. 7167-4012

Cat. Item	Description	Qty
7112-9401	Small Outer Case	1
7112-9402	Lid for Outer Case	1
7167-4021	TRIGEN Base Tray	1
7163-1066	Medium Hexdriver	1
7163-1068	Short Hexdriver	1
7163-1116	12.5mm Entry Reamer	1
7163-1140	Guide Bolt Wrench	1
7163-1152	9.0mm Drill Sleeve	2
7163-1161	Multipurpose Driver	1
7163-1186	Mini Connector	1
7163-1189	Screw Depth Gauge	1
7167-4000	Cannulated Awl	1
7167-4060	Entry Portal Tube	1
7167-4074	3.2mm T-handle Trocar	1
7167-4075	Honeycomb	1
7167-4076 or 7175-4576	T-handle	1
7167-4077	Reducer	1
7167-4077	Reducer Connector	1

Cat. Item	Description	Qty
7167-4078	Obturator	1
7167-4079	Ruler	1
7167-4080	Gripper	1
7167-4081	Impactor	1
7167-4082	Slotted Hammer	1
7167-4083	4.0mm Drill Sleeve	2
7167-4084	Screwdriver Release Handle	1
7167-4085	Screw Length Sleeve	1
7167-4092	Entry Portal Handle	1
7167-1212	TRIGEN Reamer Set, Optional	1
7111-8200	SCULPTOR® Flexible Reamer, Optional	1
7163-1130	Flexible Reamer Extender, Optional	1
7164-1123	TRIGEN 4.0 Diaphyseal Drill	1
7163-1121	4.0mm Long AO Pilot Drill, 333mm, Disposable	2
7167-1123	4.0mm Short AO Pilot Drill, 161mm, Disposable	1
7167-4130	3.2mm x 343mm Brad Point Tip Guide Pin, Disposable	3
7163-1070	Long Hexdriver, Optional	1
7175-1153	AO Mini Connector, Optional	1
7163-1187	Trinkle to Mini Connector, Optional	1



TRIGEN® META-NAIL® Instrument Set

Set No. 7165-4002

Cat. Item	Description	Qty
7165-4501	META-NAIL Anterior Drop	1
7165-4502	META-NAIL Drill Guide	1
7165-4503	META-NAIL Extension Drill Guide	1
7165-4505	Extension Guide Bolt (23mm)	2
7165-4506	Guide Bolt Long (51mm)	2
7165-4520	Long Screw Length Sleeve	1
7165-4554	Cannulated Impactor-Short	1
7163-1025	Large Nail Extractor	1

Blocking Screw Instrument Set (Optional)

Set No. 7165-4001

Cat. Item	Description	Qty
7165-4515	Blocking Screw Device	1
7165-4509	Tibial Blocking Screw Attachment	1
7165-4522	11.0mm T-handle Awl	1
7165-4511	8.5mm/10mm Blocking Screw Cartridge	1
7165-4513	11.5mm/13mm Blocking Screw Cartridge	1
7165-4514	Offset Blocking Screw Cartridge	1
7165-4523	Blocking Screw Alignment Pin	2
7163-4508	Retrograde Femoral Blocking Screw Attachment	1

META-NAIL Disposables

Set No. 7165-4003

Cat. Item	Description
7163-1110	4.0mm Long Pilot Drill*
7163-1117	4.0mm Short Drill**
7163-1626	3.0mm x 1000mm Ball Tip Guide Rod
7167-4130 or 7163-1436	3.2mm Brad Point Guide Pin
7165-4528	Universal Compression Driver
7163-1320	Disposable Nail Extractor***

*The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with 4.0mm AO Long Drill (7163-1121)

**The 4.0mm Short Drill (7163-1117) is interchangeable with 4.0mm AO Short Drill (7163-1123)

***The Disposable Nail Extractor (7163-1320) is interchangeable with the Large Nail Extractor (7163-1278) located in the original TRIGEN Instrument Set (7163-1326) and the HFN® Instrument Set (7170-0001)

Implants

5.0mm Internal Captured Screws (Gold)

Cat. Item	Length
7164-5020	5.0mm x 20mm
7164-5022	5.0mm x 22.5mm
7164-5025	5.0mm x 25mm
7164-5027	5.0mm x 27.5mm
7164-5030	5.0mm x 30mm
7164-5032	5.0mm x 32.5mm
7164-5035	5.0mm x 35mm
7164-5037	5.0mm x 37.5mm
7164-5040	5.0mm x 40mm
7164-5042	5.0mm x 42.5mm
7164-5045	5.0mm x 45mm
7164-5047	5.0mm x 47.5mm
7164-5050	5.0mm x 50mm
7164-5052	5.0mm x 52.5mm
7164-5055	5.0mm x 55mm
7164-5057	5.0mm x 57.5mm
7164-5060	5.0mm x 60mm
7164-5062	5.0mm x 62.5mm
7164-5065	5.0mm x 65mm
7164-5067	5.0mm x 67.5mm
7164-5070	5.0mm x 70mm
7164-5072	5.0mm x 72.5mm
7164-5075	5.0mm x 75mm
7164-5077	5.0mm x 77.5mm
7164-5080	5.0mm x 80mm
7164-5085	5.0mm x 85mm
7164-5090	5.0mm x 90mm
7164-5095	5.0mm x 95mm
7164-5100	5.0mm x 100mm
7164-5105	5.0mm x 105mm
7164-5110	5.0mm x 110mm

5.0mm

TRIGEN° META-NAIL° 10mm Retrograde Femoral

Set No. 7165-1000

Cat. Item	Length
7165-3018	18cm
7165-3020	20cm
7165-3022	22cm
7165-3024	24cm
7165-3026	26cm
7165-3028	28cm
7165-3030*	30cm
7165-3032*	32cm
7165-3034*	34cm

Cat. Item	Length
7165-3036*	36cm
7165-3038*	38cm
7165-3040*	40cm
7165-3042*	42cm
7165-3044	44cm
7165-3046	46cm
7165-3048	48cm
7165-3050	50cm

* Contained in the standard implant set

TRIGEN® META-NAIL® 11.5mm Retrograde Femoral
Set No. 7165-1001

Cat. Item	Length
7165-3218	18cm
7165-3220	20cm
7165-3222	22cm
7165-3224	24cm
7165-3226	26cm
7165-3228	28cm
7165-3230*	30cm
7165-3232*	32cm
7165-3234*	34cm

Cat. Item	Length
7165-3236*	36cm
7165-3238*	38cm
7165-3240*	40cm
7165-3242*	42cm
7165-3244	44cm
7165-3246	46cm
7165-3248	48cm
7165-3250	50cm

TRIGEN META-NAIL 13mm Retrograde Femoral
Set No. 7165-1002

Cat. Item	Length
7165-3418	18cm
7165-3420	20cm
7165-3422	22cm
7165-3424	24cm
7165-3426	26cm
7165-3428	28cm
7165-3430*	30cm
7165-3432*	32cm
7165-3434*	34cm

Cat. Item	Length
7165-3436	36cm
7165-3438*	38cm
7165-3440*	40cm
7165-3442*	42cm
7165-3444	44cm
7165-3446	46cm
7165-3448	48cm
7165-3450	50cm

Nail Cap Set Screw
Cat. No. 7165-6000

TRIGEN Nail Caps

Cat. Item	Length
7163-4000	0mm
7163-4005	5mm
7163-4010	10mm
7163-4015	15mm
7163-4020	20mm

STABLE-LOK® Nut
(Used with 5.0mm internal captured screws)
Cat. No. 7163-2001

CAUTION: U.S. Federal law restricts these devices to sale by or on the order of a physician.

* Contained in the standard implant set

Appendix A

Blocking screw technique

Incision and entry point

1. Make a 3–4cm midline incision, followed by a medial parapatellar capsular incision to expose the intercondylar notch.
2. Gently retract the patellar tendon laterally.

Note: Locate the entry point within the intercondylar notch just anterior and lateral to the femoral attachment of the posterior cruciate ligament (Figure 1).

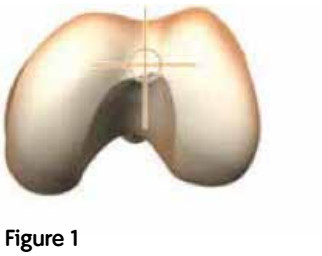


Figure 1

Establish the entry portal

Insert the 11.0mm T-handle Awl (7165-4522) manually to a depth just distal to the fracture (Figure 2).

Note: When creating the initial entry point, pay close attention to the trajectory of the awl and the relationship to the anatomic axis of the femur. Correct awl trajectory in the distal fragment must be established prior to alignment with the anatomic axis of the proximal fragment to ensure accurate fracture reduction when the nail is inserted.

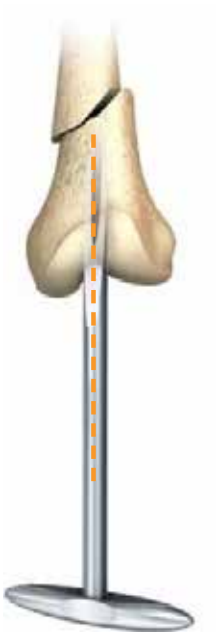


Figure 2

AP blocking screw insertion

In order to prevent varus or valgus malalignment of the distal fragment, blocking screws can be placed in the AP plane.

1. Attach the Blocking Screw Device (7165-4515) to the 11.0mm T-handle Awl and move it into the desired position in the AP plane (Figure 3).

Note: The Blocking Screw Alignment Pins (7165-4523) can be screwed into the three threaded holes on the metal handle of the Blocking Screw Device to serve as external points of reference during fracture alignment.

2. Tighten the device to the awl and insert the appropriate Blocking Screw Cartridge (7165-4511, 7165-4513, or 7165-4514).

Figure 3

3. Adjust the cartridge proximally or distally within the Blocking Screw Device to determine blocking screw position.
4. Insert the gold 9.0mm Drill Sleeve and silver 4.0mm Drill Sleeve into the desired cartridge hole and down to the bone (Figure 4).
5. Drill both cortices with the 4.0 mm Long Pilot Drill*.

   Note: Use caution during drilling and insertion of blocking screws in the AP plane. Do not drill past the posterior cortex or insert a screw that is too long. Damage to the neurovascular structures located posterior and distal femur may result.
6. Read the exposed drill bit calibrations to determine the screw length or remove the 4.0mm Drill Sleeve and measure with the Screw Depth Gauge.
7. Use the Medium Hexdriver/T-handle assembly to insert the screw until the screw engages the far cortex.
8. Implant the distal blocking screw and reduce the fracture.
9. Pass the 11.0mm T-handle Awl into the proximal fragment (Figure 5).
10. Reposition either the Blocking Screw Cartridge or the awl as necessary and repeat this blocking screw technique for additional nails.

Figure 4

Figure 5

ML blocking screw insertion

To prevent anterior or posterior malalignment of the distal fragment, blocking screws may also be placed in the ML (mediolateral) plane.

1. Attach the Blocking Screw Device to the 11.0mm T-handle Awl.
2. Rotate the Blocking Screw Device into the desired position in the ML plane (Figure 6).
3. Tighten the device to the awl and insert the appropriate Blocking Screw Cartridge (Figure 7).
4. Adjust the Cartridge proximally or distally within the Blocking Screw Device to determine the blocking screw position.
5. Insert the blocking screw as previously described.

Figure 6

Figure 7

* The 4.0mm Long Pilot Drill (7163-1110) is interchangeable with the 4.0mm AO Long Drill (7163-1121).

Blocking screw insertion with a reducer

Blocking screws can also be inserted by attaching the Blocking Screw Device to the Reducer instead of the 11.0mm T-handle Awl (Figure 8). Follow the previously described blocking screw insertion technique.

Figure 8

Final view: AP and ML blocking screw insertion

1. Once blocking screw insertion is complete, remove the Blocking Screw Device from the 11.0mm T-handle Awl or Reducer.
2. Obtain both AP and lateral radiographic images to confirm accurate placement.

   Note: The Awl or Reducer provides a reliable indication of the nail's insertion trajectory based upon the location of the blocking screws.
3. Confirm proper screw placement (Figure 9).
4. Proceed with nail insertion.

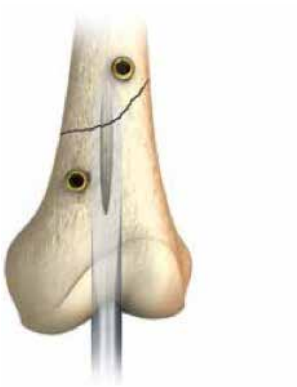


Figure 9

Stability blocking screw insertion

Following nail insertion and confirmation of fracture reduction, blocking screws may be placed on either side of the nail in the metaphyseal region for additional stability. Screws may be inserted in both the AP and ML planes.

1. With the nail inserted, attach the Retrograde Femoral Blocking Screw Attachment (7165-4508) (Figure 10) to the Anterior Drop (triangle to triangle for AP screws and square to square for ML screws).
2. Follow the previously described techniques for cartridge positioning and blocking screw insertion (Figure 11).

   Note: The AP blocking screws targeted through the two holes built into the Anterior Drop cannot be used if the most superior oblique distal locking screw has been inserted.

Figure 10

Figure 11

Final view: Stability blocking screws

1. Once stability blocking screw insertion is complete, remove the Blocking Screw Attachment and Anterior Drop from the drill guide.
2. Obtain both AP and lateral radiographic images to confirm accurate placement (Figures 12 and 13).

Figure 12

Figure 13

Appendix B

TRIGEN® STABLE-LOK® Nut and Washer

The TRIGEN STABLE-LOK Nut and Washer (7163-2001) offers increased purchase in low density or osteoporotic bone. Used with a corresponding 5.0mm TRIGEN Internal Hex Head Screw (Figure 1), the STABLE-LOK Nut and Washer resists screw back-out while improving fixation.

Figure 1

To implant the cortical screw, use the TRIGEN 4.0mm Long Pilot Drill (7163-1121), the TRIGEN Screw Depth Gauge (7163-1189) and a second TRIGEN T-Handle (7167-4076 or 7167-4576). Alternatively, use the optional Straight Ratcheting Driver (7175-1141) attached to a short or medium TRIGEN Hexdriver (7163-1068; 7163-1066).

1. Use powered instrumentation to advance the TRIGEN 4.0mm Long Pilot Drill into the bone.
2. Continue to advance the drill until full penetration of the opposite cortex and soft tissue is complete.
3. Make a small incision over the drill bit and down to the cortex to allow a path for the STABLE-LOK Nut.

   Note: Ensure sufficient soft tissue release to properly seat the nut.
4. Remove the retaining rod from the Multipurpose Driver (7163-1161).
5. Assemble the STABLE-LOK Nut (Figure 2) onto the driver, guide it over the Long Pilot Drill, and thread the nut securely into the bone.

Figure 2. STABLE-LOK Nut

6. Remove the drill.
7. Insert the TRIGEN Screw Depth Gauge (7163-1189) into the 4.0mm hole and hook it onto the far side of the nut.

   Note: The length of the Internal Hex Head Screw should correspond exactly with the reading on the Screw Depth Gauge.

   Note: If a lag technique will be used, consider the appropriate amount of compression when choosing the correct screw length.

8. Attach the Multipurpose Driver (Part #7163-1161) to a second T-handle or Straight Ratcheting Driver (7175-1141).
9. Insert the Multipurpose Driver through the STABLE-LOK◇ incision portal to hold the nut in place while inserting the screw.
10. Place the Washer on the Internal Hex Head Screw, and advance the screw through the pre-drilled hole until it engages the STABLE-LOK Nut on the far cortex (Figure 3).

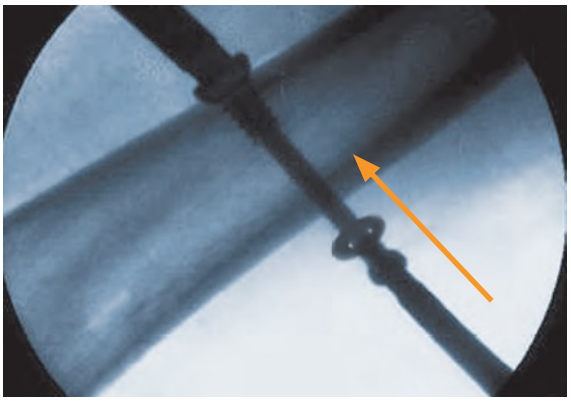


Figure 3

Notes:

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